

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Solve : $y'' + 2iy' + y = x$
17. Solve : $y'' - 4y' + 5y = 3e^{-x} + 2x^2$.
18. Two solutions of $x^3 y''' - 3xy' + 3y = 0$ ($x > 0$) are $\phi_1(x) = x$, $\phi_2(x) = x^3$. Find a third independent solution.
19. Find the solution of the equation $x^2 y'' + \frac{3}{2} xy' + xy = 0$.
20. Consider the initial value problem $y' = 3y + 1$, $y(0) = 2$
- (a) Compute the first four approximations $\phi_0, \phi_1, \phi_2, \phi_3$
- (b) Computer the solution $\phi(x)$.

NOVEMBER/DECEMBER 2025

GMA13/DMA13 — ORDINARY
DIFFERENTIAL EQUATIONS

Time : Three hours

Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Define homogeneous equation with example.
2. State uniqueness theorem for the second order linear equation.
3. Define initial value problem for n^{th} order equation.
4. State existence theorem for linear equations with constant coefficient.
5. Define Gramian of $\phi_1, \phi_2, \dots, \phi_n$.
6. Define n^{th} Legendre polynomial.
7. Write the Euler equation.



8. Write the Bessel function of order of the second kind.
9. Find all real valued solutions of the equation $yy' = x$.
10. State Lipschitz condition.

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL the questions.

11. (a) Find all solution of the equation $y'' - 4y' + 5y = 0$.

Or

- (b) Solve : $y'' - y' - 2y = e^{-x}$.

12. (a) Find all the solution of $y^{(4)} - 16y = 0$

Or

- (b) Using the annihilator method find a particular solution of the equation $y''' = x^2 + e^{-x} \sin x$.

13. (a) Solve : $y'' + \frac{y'}{x} - \frac{y}{x^2} = 0$ with initial condition $y(1) = 1$; $y'(1) = 0$.

Or

- (b) Show that $\int_{-1}^1 P_n^2(x) dx = \frac{2}{2n+1}$.

14. (a) Find all the solutions of the equation $x^3 y''' + 2x^2 y'' - xy' + y = 0$ for $x > 0$.

Or

- (b) Show that $x^{\frac{1}{2}} J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi}} \sin x$.

15. (a) Solve : $y' = \frac{x+y}{x-y}$.

Or

- (b) Solve : $(e^y + xe^y)dx + xe^y dy = 0$.